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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA GENERAL WORKING PAPER

DESCRIPTION AND APPLICATIONS OF FLUOREL L-3203-6

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

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DESCRIPTION AND APPLICATIONS OF FLUOREL L-3203-6

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DESCRIPTION AND APPLICATIONS OF FLUOREL L-3203-6

By D. E. Supkis

INTRODUCTION

The manned space-flight program has witnessed countless new equipment and materials developments to meet the needs of a relatively new technology. One of the primary needs, as made evident by the Spacecraft 204 fire at Cape Kennedy, was for new nonflammable materials to be used in the 100-percent-oxygen atmosphere of spacecraft. These materials were required for replacement of flammable rubber components such as boot soles, belts, and hoses, for replacement of flammable plastics, for use as nonflammable coating materials for flammable substrates, and for use as adhesives to replace cements currently used in spacecraft. In addition to being nonflammable, new materials had to meet minimum requirements for toxicity, odor, total organics, and flash and fire points.

Fluorel, a fluorinated hydrocarbon copolymer of hexafluoropropene and vinylidene fluoride, is one of the materials adapted to meet the above needs and requirements. The basic raw material for Fluorel was developed and supplied by the Chemical Division of the Minnesota Mining and Manufacturing Company. One particular Fluorel compound, L-3203-6, was developed by Raybestos-Manhattan in cooperation with the Supporting Development Branch, NASA Manned Spacecraft Center. Fluorel L-3203-6 has demonstrated considerable versatility of application and has exhibited the best nonflammability characteristics of any of the ambient-cured Fluorel compounds developed to date. Designated by the manufacturer as REFSET (Raybestos-Manhattan Elastomers For Space Exploration Travel), this compound, in its various forms, has met all of the requirements set forth for nonmetallic materials (ref. 1) in tests conducted at the White Sands Test Facility (WSTF) (reference numbers 68-0936 and 67-0824).

Raybestos-Manhattan utilized the original Fluorel copolymer developed by the Minnesota Mining and Manufacturing Company and, using different techniques and plasticizers, recompounded it to produce the many varieties of L-3203-6. The mill sheet can be fabricated into such items as belts, flight boot soles, circuit breakers, and toggle switches. By

solvation (20 percent of Fluorel L-3203-6 solids homogenized in methylethylketone (MEK)), this compound can be used as a paste or spray solution for conformal coatings on flammable materials which cannot be replaced. Thus, Fluorel L-3203-6 provides two means of fireproofing by serving as a material for fabrication of nonflammable components and as a coating for flammable substrates. In addition, the L-3203-6 solution has been used as an adhesive. The physical properties of the cured compound are presented in table I. Fluorel L-3203-6 is commercially available from Raybestos-Manhattan.

ACKNOWLEDGMENT

The Fluorel L-3203-6 development program has been a cooperative effort between the NASA and private industry. The author wishes to acknowledge the invaluable assistance and contributions of the following people and their companies: Messrs. R. L. Holmes, J. V. Owens, H. E. Easton, and C. Grayson of Raybestos-Manhattan, Incorporated; Mr. D. A. Stivers of the Minnesota Mining and Manufacturing Company; and finally Mr. W. P. Foote of the Harshaw Chemical Company. The author also expresses his gratitude to the many others who have contributed their time and talents to this project.

FLUOREL L-3203-6 MILL SHEET

Fluorel L-3203-6 mill sheet has been successfully molded into various flight components. Pressure garment assembly (PGA) flight boot soles (fig. 1) and electrical harness boots (fig. 2) have flown on Apollo spacecraft. Circuit breaker cases have been fabricated and evaluated. Data from electrical tests performed by the Space Electronic Systems Division, NASA Manned Spacecraft Center, indicate that the Fluorel cases compare favorably with the glass-filled melamine and ceramic circuit breaker cases presently being used (ref. 2). In addition, the Fluorel cases are lighter and unbreakable. Fluorel L-3203-6 mill sheet has also been used by North American Rockwell as flooring material in an environmental test chamber. Other applications which are presently being evaluated include toggle switches and wire bundle ties.

FLUOREL L-3203-6 SOLUTION

Fluorel L-3203-6 has been used most often in the form of a homogenized solution for conformal coatings. In this form, the compound

requires no curing. However, with a slight cure (3 hours at 150° F), the solution can be catalyzed with hexamethylenediamine carbamate to obtain varied physical properties. This catalysis, however, is recommended only when the end product will be used in an environmental temperature of less than 150° F. The physical properties of L-3203-6 coatings (uncured) are given in table II.

The solution must be stored at a temperature of 40° F to obtain a shelf life of 4 to 6 months. Higher temperatures will result in a shorter storage time. In addition to the problems associated with storage, Interstate Commerce Commission regulations prohibit shipping of more than 1 quart of solution at a time. Since the mill sheet has an extended shelf life and the shipping of it is not restricted, it is advantageous to mix the solution as it is needed. This can be accomplished using the following procedure to produce 1 gallon of solution.

1. Soak 550 grams of L-3203-6 mill sheet (chopped) in 2600 grams of methylethylketone overnight to soften the rubber.

2. Homogenize the solution using an Eppenbach explosionproof Homo-Mixer, model 1-LA, until the Fluorel is dissolved (approximately 5 minutes).

3. Filter the solution through a gauze screen to remove any undissolved solids.

Additives

Inorganic pigments.- Inorganic pigments can be added to the solution to obtain almost any color desired. However, these pigments must be added in quantities less than 5 percent by weight to prevent detrimentally affecting the elongation properties of the material. The following pigments were provided by the Harshaw Chemical Company and have passed all Apollo requirements.

Color	Rx number
Meteor Pink	7132
Meteor Green	7465
Meteor Cobalt Blue	7540
Meteor Red Brown	7751
Meteor Tan	7729
Meteor Yellow Buff	7370
Meteor Black	7890
Cadmium Light Red	1530
Cadmium Medium Red	1560
Gray	1462
Inorganic Gray	1236

Asbestos.- Asbestos (Raybestos-Manhattan reference number 4AJO) has been added to the L-3203-6 solution to improve its thermal and electrical insulation characteristics. The asbestos can be added in any quantity up to 50 percent by weight, at which point the cured mixture becomes brittle. For example, under ambient conditions, only a 3-mil coating of 100 percent L-3203-6 is needed to flameproof ordinary paper. At 16.5 psia in a 100-percent-oxygen atmosphere with bottom ignition using a silicon ignitor (the most stringent flammability test), a 30-mil coating of a 50-percent asbestos solution is required to protect against flammability. The Fluorel/asbestos solution can be tailored to meet any requirement between these extremes. Fluorel RL-3550, a mixture containing 75 percent of L-3203-6 and 25 percent of the asbestos, provides the optimum flexibility/flammability characteristics. A 10-mil coating of RL-3550 weighs approximately 0.17 gram per square inch.

A simple technique, developed by General Electric and modified by Dynatech, can be used to determine the relative flammability of Fluorel materials. This method is presented in appendix A.

Due to the wicking property of asbestos, its addition renders the L-3203-6 coating permeable. However, the primary end use of the Fluorel/asbestos mixture is to protect silicone potting compounds which are themselves nonpermeable. In addition, 100-percent L-3203-6 can be used as a nonpermeable subcoating before the Fluorel/asbestos coating is applied.

Primers

Improved adhesion for L-3203-6 coatings can be obtained with the use of primers. General Electric 4004 primer has been used successfully with metal substrates, and Dow Corning 3145 has performed well with silicone substrates. Products Research Corporation PRC 1513-M primer and ordinary toluene have been used in coating neoprene. When using toluene, the coating must be applied before the toluene has dried.

Applications

Mobile quarantine facility interior coating.- The largest single application of Fluorel L-3203-6 coating solution has been the fireproofing of the interior of the mobile quarantine facility (MQF) in which the Apollo 11 astronauts stayed following their return from the moon (fig. 3). Flammability tests had been performed on samples of the MQF interior surfaces in accordance with the "Airworthiness Standards, Transport Category Airplanes," part 35, section 25.853, test procedure. All of the original samples (except the vinyl on aluminum) failed the

test. However, samples which were coated with Fluorel L-3203-6 passed the test. As a result, all of the wood and vinyl interior surfaces were coated with the solution (fig. 4). The coating, which is originally tan in color and has a leatherette texture, was pigmented to provide a compatible color scheme. Although the coating was applied with almost no surface preparation, satisfactory adhesion was obtained. The use of L-3203-6 in this instance precluded replacement of the original materials and permitted fulfillment of the flight schedule. The procedures used for spraying and touching-up the MQF interior are presented in appendix B.

Coating of electrical components.- Fluorel L-3203-6 was used as a conformal coating on circuit breakers on the early Apollo flights (fig. 5). Flammability tests were performed on these circuit breakers by the Structures and Mechanics Division in accordance with "SMD-A4, Test Guidelines for Apollo Mockup Tests in Support of SC 2TB-1 and 101." The tests were performed in a 100-percent-oxygen atmosphere at 16.5 psia. The circuit breakers were coated with 10 to 15 mils of L-3203-6 followed by an overcoat of approximately 20 mils of RL-3550. Successful ignition was obtained, but the fire did not propagate (fig. 6). Fluorel RL-3550 has also been used as a conformal coating on printed circuit boards as shown in figure 7.

Apollo floodlight glare shield and cuff card coating.- For the Apollo missions, the commander's floodlight glare shield was coated with black-pigmented L-3203-6. The procedure used in the application is presented in appendix B. Also coated for the Apollo 11 mission were the cuff cards carried on the lunar surface by the astronauts. For this application, a 0.5-mil coating improved readability and prevented fading and blurring of the ink in the solar environment.

Coating of future spacesuit materials.- Several samples of spacesuit materials were coated with various thicknesses of Fluorel L-3203-6. These materials consisted of HT laminate and metallic Chromel-R fabric. The HT laminate samples were cured for 4 hours at 250° F, and the Chromel-R sample was cured for 16 hours at 350° F. The tests were conducted at 6.2 psia in a 100-percent-oxygen environment with bottom ignition using a tissue paper ignitor. All of the samples passed the test, and a 6-mil coating appeared to be sufficient to protect a flammable substrate for these conditions.

Additional uses of Fluorel L-3203-6 solution.- Fluorel L-3203-6, with and without asbestos, has been used for coating Beta cloth used for insulation wrapping. It has also been used to stabilize plain and leno weave glass fabrics. A coating of L-3203-6 was successfully applied to the highly flammable Kydex canopy on the Ames Research Center advanced aircraft simulator (fig. 8), and the compound was used by McDonnell-Douglas for the interior of their 90-day space station environmental simulator.

Deerskin which has been fireproofed with L-3203-6 exhibits excellent shrinkage properties (2 percent to 250° F and 9 percent to 300° F compared to uncoated values of 6.3 percent to 250° F and 12.6 percent to 300° F), making the fabrication of zero-g soft shoes (fig. 9) and flight gloves a possible application. The Fluorel compound can also be used to impregnate asbestos for insulation purposes. Figure 10 shows two samples of L-3203-6-coated asbestos which have undergone flammability and 1800° F flame impingement tests.

Adhesive Properties of L-3203-6 Solution

Fluorel L-3203-6 solution has been used to bond Teflon Velcro pile to a tape substrate, and to laminate Beta cloth. The Velcro bonding has been used in space missions. A sample of the Velcro undergoing flammability testing is shown in figure 11. Figure 12 shows two samples of Beta laminations following shear testing. The adhesive properties of L-3203-6 solution in Beta laminations are given in table III.

CONCLUDING REMARKS

At the time of the writing of this document, the Fluorel L-3203-6 program has advanced beyond the fundamental development stage. Emphasis at present is being placed on exploring new areas for application of the Fluorel compound. At the same time, finishing techniques are being refined to permit more decorative and appealing applications where desirable; for example, the interior of commercial passenger aircraft. This particular application is an outgrowth of the Mobile Quarantine Facility coating which has met requirements set forth by the Federal Aviation Agency.

The military has expressed interest in using the compound to reduce onboard fire hazards in both combat and crash environments. The United States Navy is considering the use of the Fluorel compound for fabricating nonflammable wetsuits to reduce the flammability hazards in the oxygen-enriched atmosphere of decompression chambers.

In addition to the numerous flameproofing applications, L-3203-6 coatings are being considered for use in preventing corrosion of electrical components in tropical climates.

Since Fluorel L-3203-6, in its many forms, can be used to flameproof virtually any substrate, the possibilities for its application in transportation and construction are almost limitless. In time, this compound may prove to be one of the more valuable and useful by-products of the program for manned exploration of space.

REFERENCES

1. Anon.: Nonmetallic Materials Requirements, Category A. MSC-PA-D-67-13, Feb. 1968.

2. Lockheed Electronics Company: Fluorel Circuit-Breaker Encasing Material Electrical Tests. MSC/ISD Document 21-171, Oct. 1969.

TABLE I.- PHYSICAL PROPERTIES OF FLUOREL L-3203-6 (CURED)

Press cure	30 min at 320° F
Postcure	16 hr at 400° F

Mechanical properties	
Durometer, Shore A	
Press cure, 30 min at 320° F	82
Postcure, 16 hr at 250° F	96
Postcure, 16 hr at 300° F	95
Postcure, 16 hr at 350° F	95
Postcure, 16 hr at 400° F	97
Tensile strength, psi	
Press cure, 30 min at 320° F	657
Postcure, 16 hr at 250° F	1660
Postcure, 16 hr at 300° F	1548
Postcure, 16 hr at 350° F	1500
Postcure, 16 hr at 400° F	1558
Elongation, percent	
Press cure, 30 min at 320° F	362
Postcure, 16 hr at 250° F	113
Postcure, 16 hr at 300° F	88
Postcure, 16 hr at 350° F	75
Postcure, 16 hr at 400° F	75
ASTM tear strength (Die C), lb/in.	
Postcure, 16 hr at 350° F	128
Specific gravity	2.11
Mooney at 212° F	1.47
Air-oven aged 7 days at 400° F	
Tensile strength, psi	1155
Durometer, Shore A	98
Elongation, percent	50

TABLE I.- PHYSICAL PROPERTIES OF FLUOREL L-3203-6 (CURED) - Continued

Bashore resilience, percent	5
Compression set, percent	
After 22 hr at 400° F	64.5
Low temperature (Gehman flexibility), °F	
T2	+68
T5	+62
T10	+55
T1000	-8
Low temperature (Brittle point), °F	
1/16 gage	+17.6
1/32 gage	-7.6
1/64 gage	-27.4
Electrical properties	
Volume resistivity ohm/cm	9.8×10^{12}
Dielectric strength, V/mil	525
Frequency	
Dielectric constant at 25° C	
100 Hz	8.00
1 kHz	7.83
10 kHz	7.50
100 kHz	6.85
Dissipation factor at 25° C	
100 Hz	0.0075
1 kHz	0.0204
10 kHz	0.0373
100 kHz	0.0524
Thermal conductivity, $Btu/ft^2/°F/in.$	1.37
Hydrogen permeability (15-mil sheet), $liter/meter^2/24$ hr	0.5

TABLE I.- PHYSICAL PROPERTIES OF FLUOREL L-3203-6 (CURED) - Concluded

Weight loss, percent	
125° C	1.0
250° C	1.5
300° C	4.0
450° C	4.0
Chemical properties	
Total organics, μg/g	0.88
Carbon monoxide, μg/g	0.72
Odor concentration (present rating system)	
1 part to 29 parts O_2	0.1
1 part to 9 parts O_2	0.3
No dilution	1.0

TABLE II.- PHYSICAL PROPERTIES OF FLUOREL L-3203-6 (UNCURED)

Property	Uncatalyzed	Catalyzed
No postcure		
Shore A hardness	79	80
Tensile, psi	94	45
Elongation, percent	574	850
Gage of film, in.	0.022	0.017
Postcure for 8 hr at 250° F		
Shore A hardness	91	87
Tensile, psi	444	551
Elongation, percent	488	625
Gage of film, in.	0.018	0.015

TABLE III.- FLUOREL L-3203-6 ADHESIVE — BOND STRENGTHS OF BETA LAMINATIONS

Lamination	Primer	Cure	Peel strength, lb/in.	Shear strength, lb/in.
Beta with L-3203-6	No	16 hr at 250° F	1.50	120 — Beta failed
Beta with L-3203-6	No	24 hr at 150° F	1.73	120 — Beta failed
Beta with L-3203-6	Yes	24 hr at 400° F	1.20	120 — Beta failed
Beta with L-3203-6	Yes	24 hr at 400° F	.80	59 — Broke at bond
N136B Neoprene			3.00	120 — Beta failed

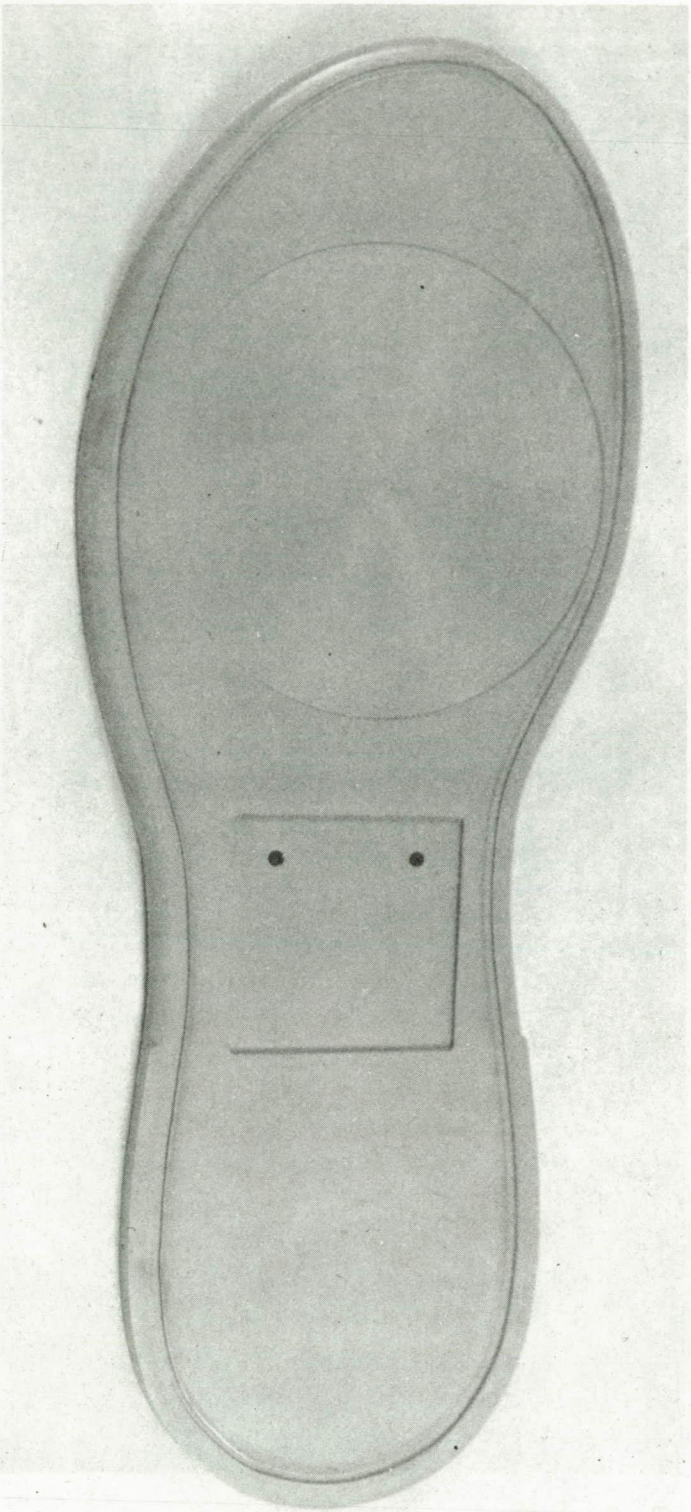


Figure 1.- Fluorel PGA flight boot sole.

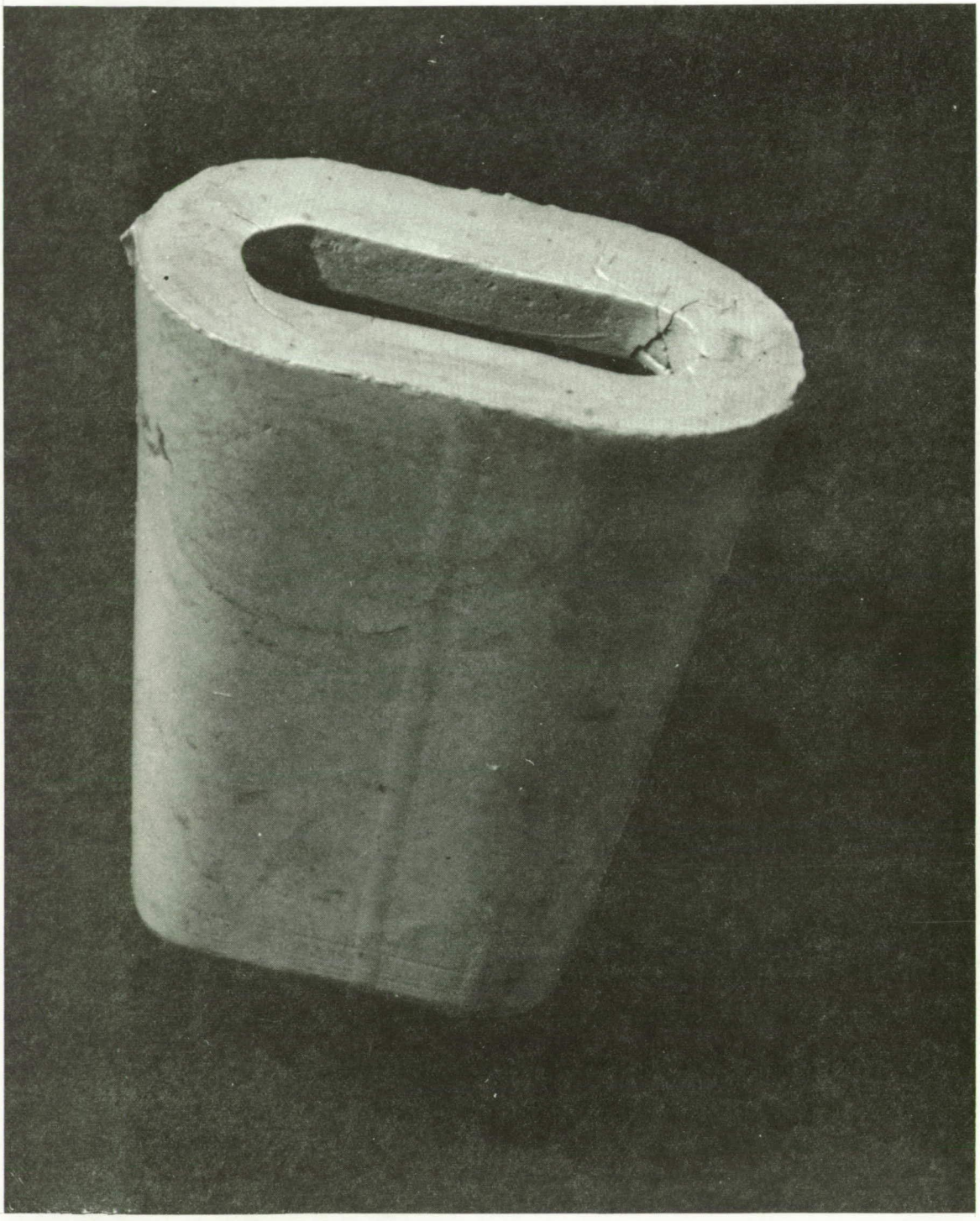


Figure 2.- Fluorel electrical harness boot.

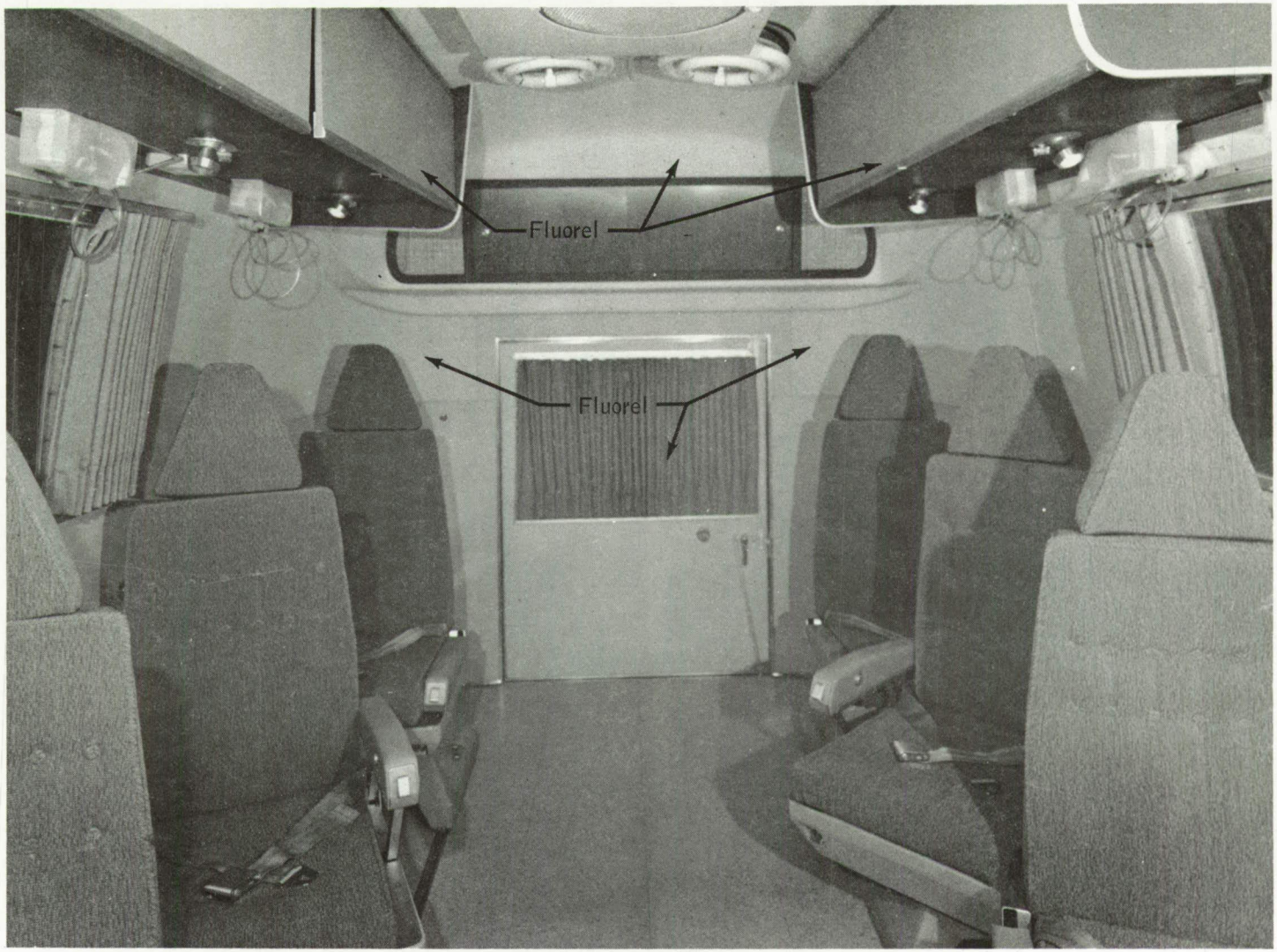


Figure 3.- Interior of the mobile quarantine facility.

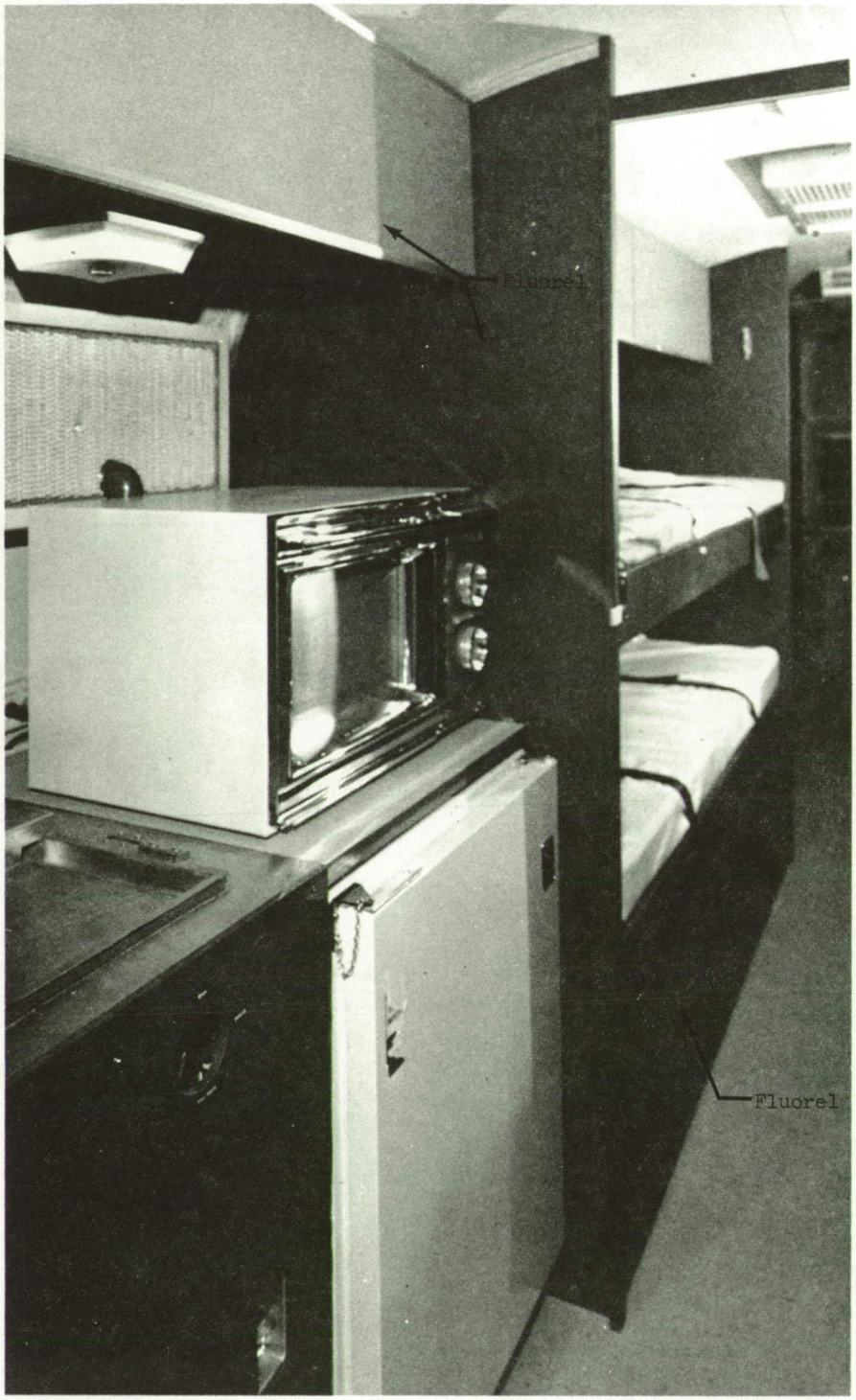

Fluorel
Fluorel

Figure 4.- Fluorel L-3203-6 being applied to the mobile quarantine facility.

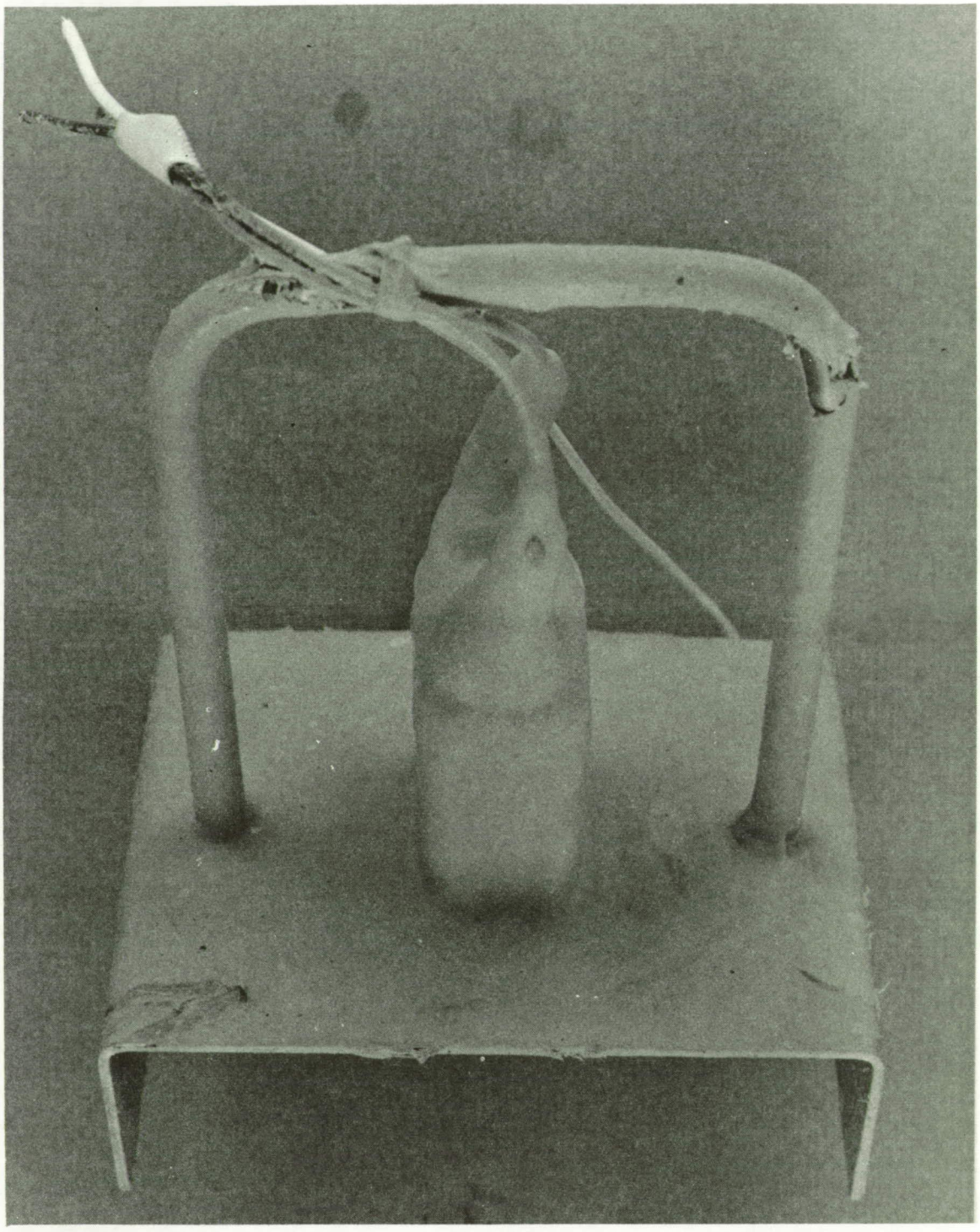


Figure 5.- Apollo circuit breaker coated with Fluorel RL-3550.

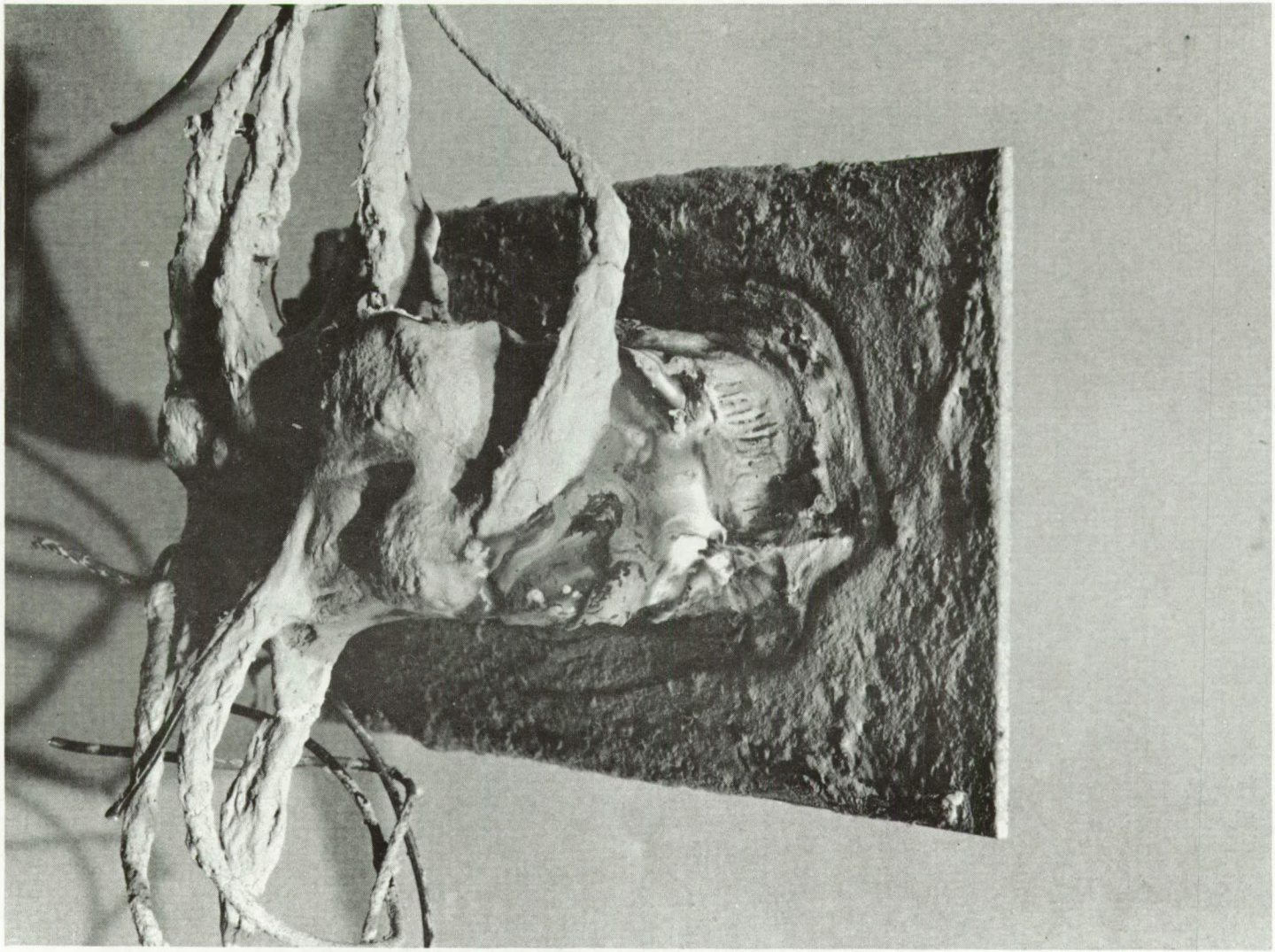


Figure 6.- Fluorel RL-3550-coated circuit breaker following flammability testing.

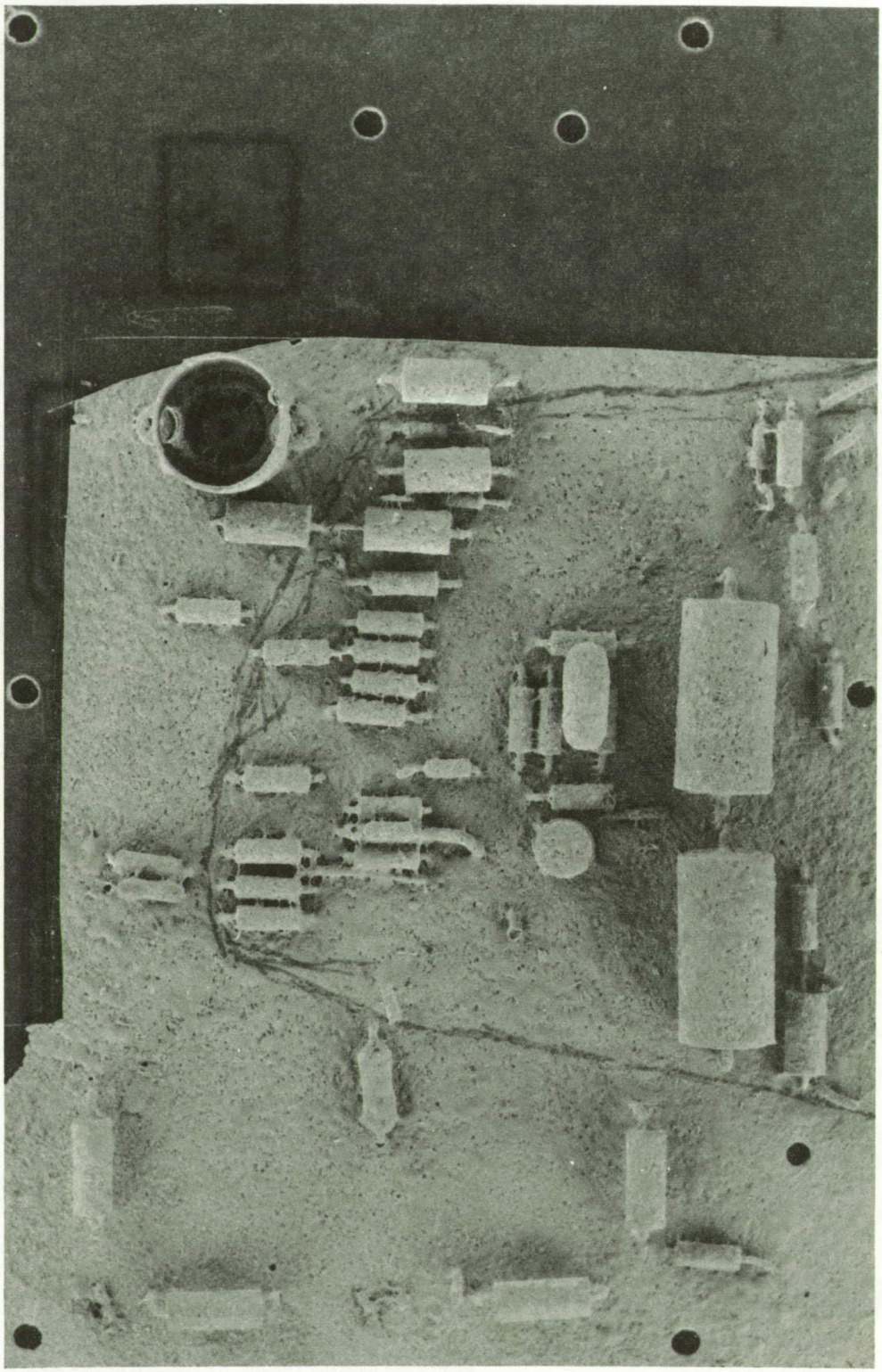


Figure 7.- Fluorel RL-3550 conformal coating on a printed circuit board.

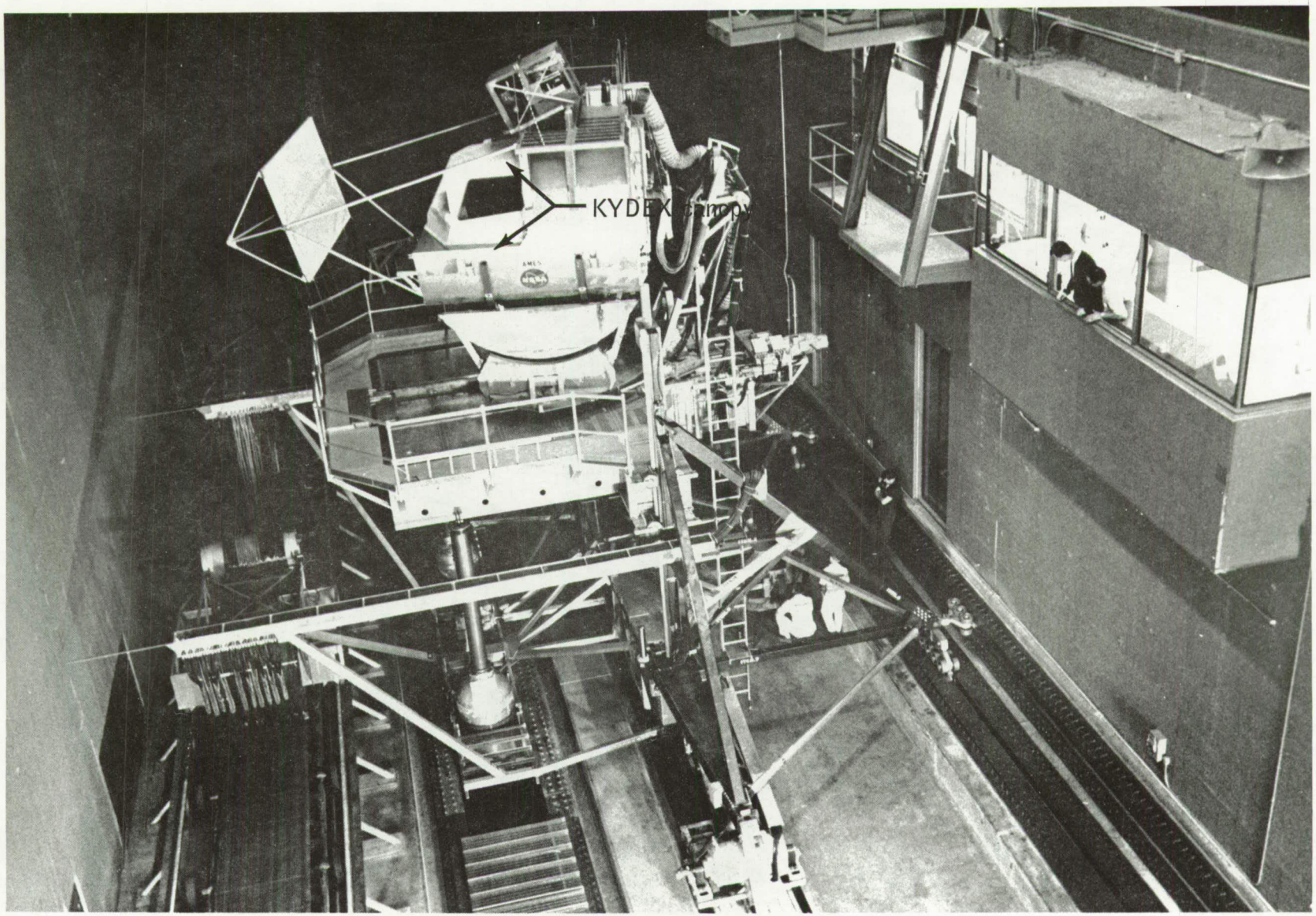
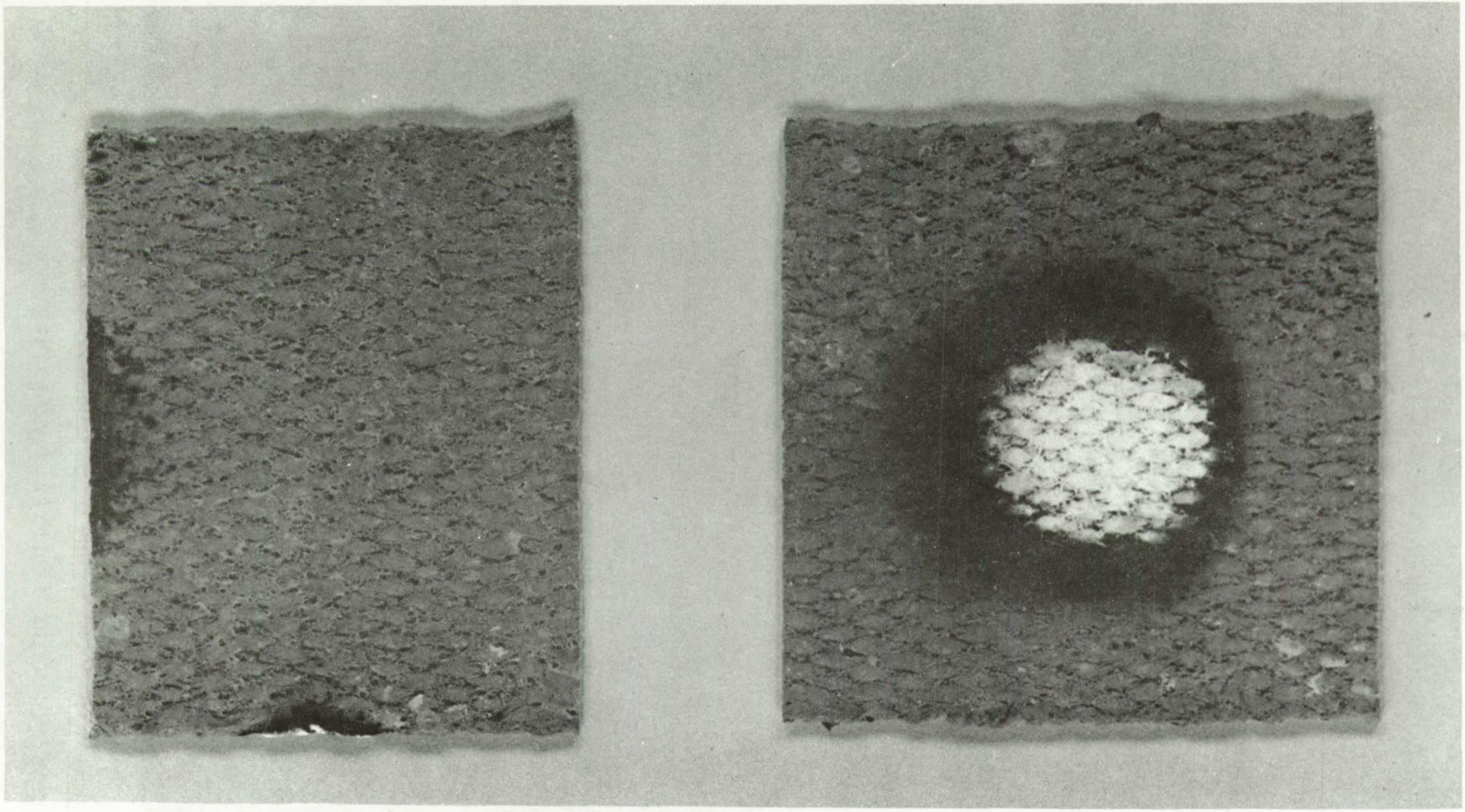


Figure 8.- The Ames Research Center advanced aircraft simulator.

Figure 9.- Zero-g soft shoes coated with Fluorel L-3203-6.



(a) Flammability test. (b) Flame impingement test (1800° F).

Figure 10.- Fluorel L-3203-6 impregnated asbestos samples following flame testing.

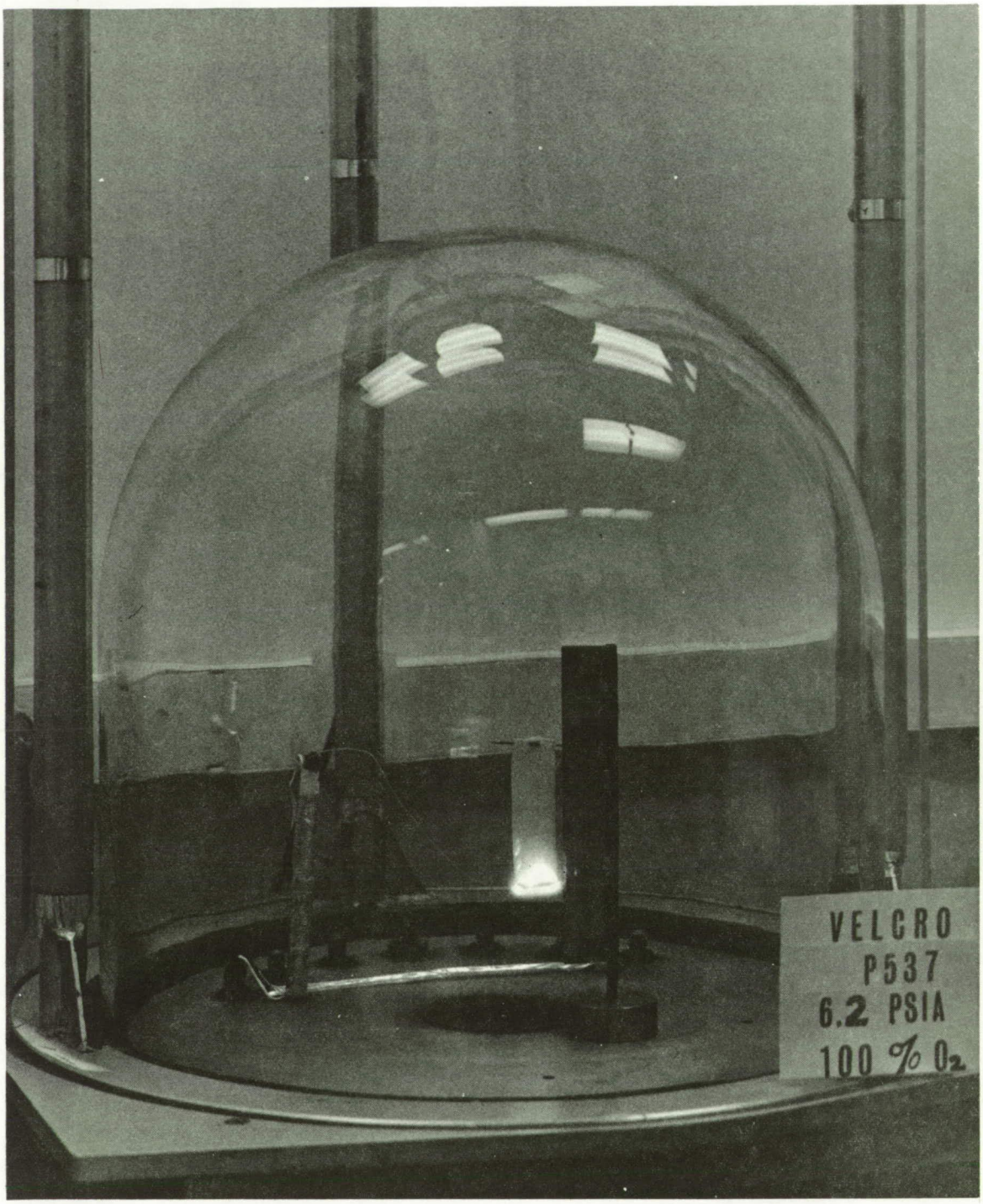


Figure 11.- Flourel L-3203-6-bonded Velcro sample during flammability testing.

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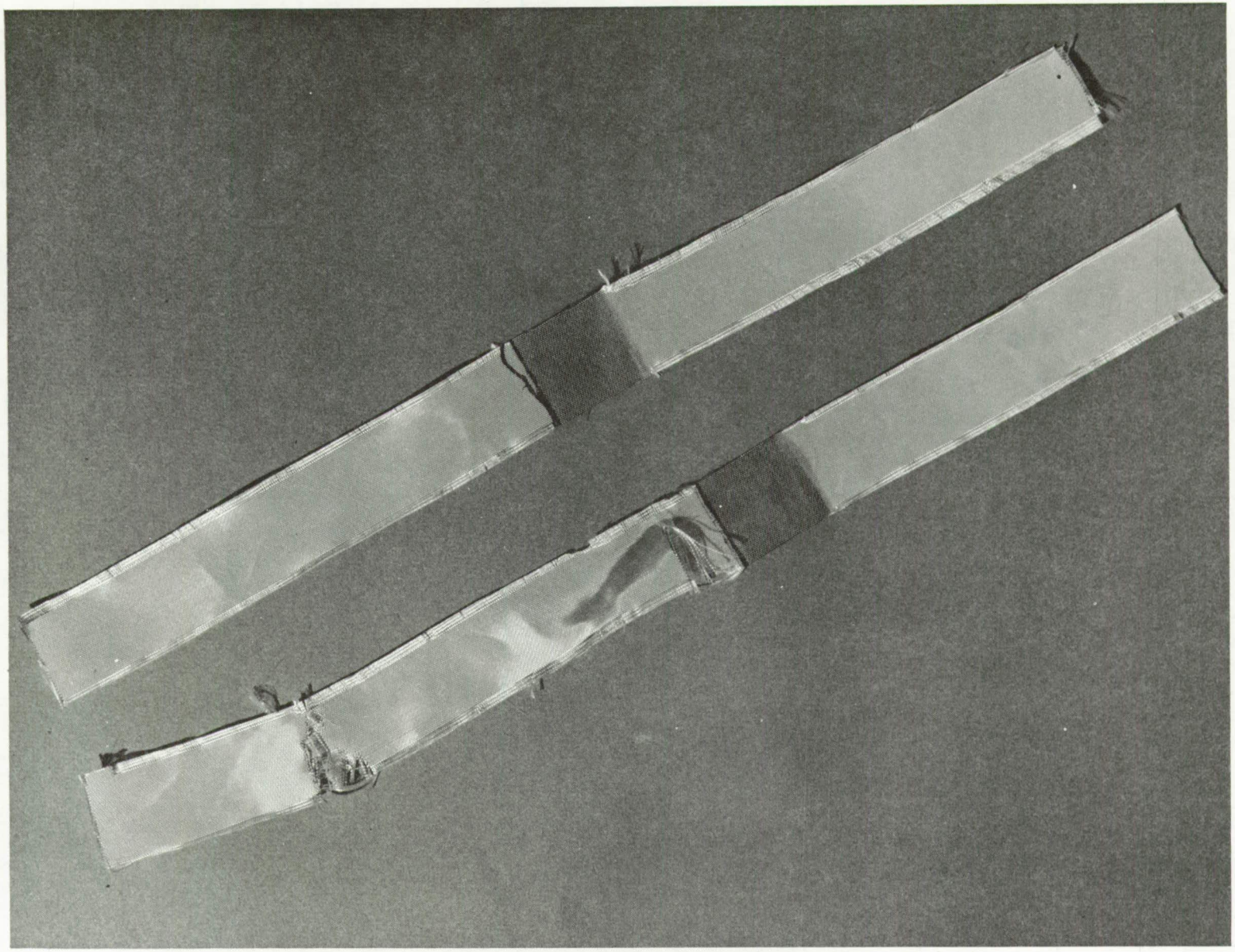

Figure 12.- Samples of Beta laminations following shear testing.

APPENDIX A

THE DYNATECH FLAMMABILITY INDEX TESTER

The concept of a simple test for determining the relative flammability of materials was originated by the General Electric Company. The theory of the test provides for the burning of samples (using top ignition) in different combinations of selected gases to determine the minimum volumetric concentration of oxygen needed to support burning. The minimum amount of oxygen is called the limiting oxygen index; a high limiting oxygen index value denotes relatively poor flammability properties.

Dynatech modified the General Electric test for use in determining the flammability of individual coating components and coated fabrics. A sketch of the Dynatech apparatus is presented in figure A-1. The test procedure is as follows.

1. Clamp the specimen with a small tubing clamp so that at least 1 inch of the sample extends above the clamp.

2. Place the sample on the support stand in the Pyrex chimney.

3. Select a test gas mixture. For example:

$$\frac{\text{liters } O_2}{\text{total liters}} = \frac{[O_2]}{[N_2] + [O_2]} = \text{oxygen index}$$

4. Adjust the flowmeters to give a total flow of 20 liters/min. For example:

$$\text{oxygen flow} = 0.6 \times 20 \text{ liters/min} = 12 \text{ liters/min}$$

$$\text{nitrogen flow} = 0.4 \times 20 \text{ liters/min} = 8 \text{ liters/min}$$

5. Wait 15 seconds for flow pattern to stabilize.

6. Ignite the sample at the top using a hot nichrome wire.

7. If the sample burns, select a lower concentration of oxygen and repeat the test (with the same flow rate of 20 liters/min).

By repeating this trial and error method, the limiting oxygen index can be determined.

Dynatech compared the results of tests performed with the Flammability Index Tester to results obtained at NASA MSC using the silicone ignitor tester. The comparison revealed a definite correlation between the limiting oxygen index of a material and whether that material will pass the latter test. For example, all samples with a limiting oxygen index greater than 0.53 passed the silicone ignitor test, while all of the samples with a lower index failed.

The Flammability Index Tester is valuable because it can accurately predict the flammability of materials in a mixed gas system; for example, all samples with a limiting oxygen index greater than 0.40 will be self-extinguishing in an atmosphere of 40 percent oxygen and 60 percent nitrogen. However, the Flammability Index Tester cannot distinguish between flaming and glowing combustion and provides little correlation with burn rates.

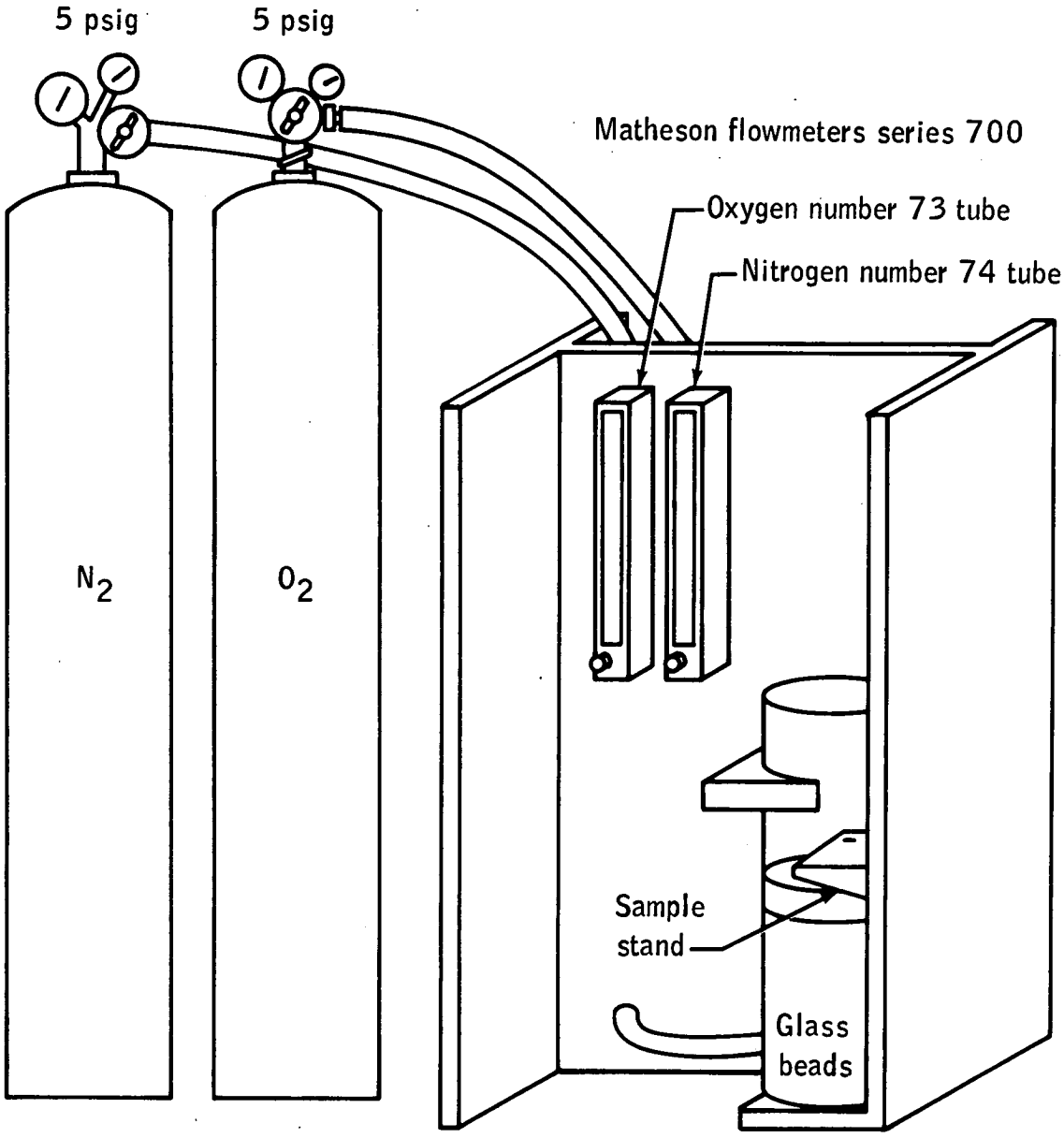

Figure A-1.- Dynatech Flammability Index Tester.

APPENDIX B

PROCEDURES FOR APPLICATION OF FLUOREL L-3203-6 SOLUTION

MOBILE QUARANTINE FACILITY FIREPROOFING PROCEDURES

Introduction

The intention of these procedures is to describe the total fireproofing (fire retardation) operations for the mobile quarantine facilities. Strict attention must be paid to all details specified in this appendix. These procedures are to be detailed further by quality control personnel such that a checklist-type inspection plan can be followed during the fireproofing operations.

Environmental Conditions

The environmental conditions in the area for painting shall be as follows.

Relative humidity	55 ± 20 percent
Air temperature	80° ± 10° F

Data

The previous environmental parameters shall be recorded three times per day during the days of painting; once in the morning, once at noon, and once in the evening.

Surface Preparations and Paint Application

MQF serial no.	Date		Inspection
		1. Clean interior and furniture surfaces with commercial grade isopropyl alcohol. 2. Allow washed surfaces to dry for 2 hours. Time drying started _____ Time drying completed _____ 3. Wash interior and furniture surfaces with a mild detergent/water solution and rinse with clean water. 4. Allow washed surfaces to dry for a minimum of 6 hours. Time drying started _____ Time drying completed _____ 5. Care must be exercised as not to contaminate the cleaned surfaces since they are ready for coating with the proper pigmented Fluorel L-3203-6, 20 percent homogenized solution. No sanding or any surface roughing is required or necessary. 6. Three different colors will be used in coating the interior and furniture surfaces. The colors are to be beige, gold, and brown and shall be prepared as follows. a. Beige is obtained by using the Fluorel L-3203-6 solution as received. Fluorel solution batch or fabrication number _____ and part number _____ used.	

MQF serial no.	Date		Inspection
		b. Gold is obtained by mixing yellow and black pigments (Harshaw Chemical Co. yellow 541-317-37, number 7370 and black 541-214-37, number 7890) in MEK using a ratio of 36 grams of yellow, 5.6 grams black pigments to 60 grams of MEK per quart of Fluorel L-3203-6, 20 percent homogenized solution (Raybestos Manhattan). The pigment mixture is added to the Fluorel solution and mixed, using a shaker for a minimum of 5 minutes. Fluorel solution batch or fabrication number _____ and part number _____ used. c. Brown is obtained by mixing red and black pigments (Harshaw Chemical Co. cadmium light red 844-591-12, number 1530 and black 541-214-37, number 7890) in MEK using a ratio of 8 grams of red, 26 grams of black pigments to 60 grams of MEK per quart of Fluorel L-3203-6, 20 percent homogenized solution (Raybestos-Manhattan). The pigment mixture is added to the Fluorel solution and mixed, using a shaker for a minimum of 5 minutes. Fluorel solution batch or fabrication number _____ and part number _____ used. NOTE The final pigmented Fluorel mixtures can be escalated by multiplying the above formulas by the number of quarts required to accomplish the task. Also, caution must be taken to prevent an excessive quantity of MEK to evaporate from the final	

MQF serial no.	Date		Inspection
		pigmented Fluorel solutions prior to application by keeping the container securely sealed. Pigmented and unpigmented Fluorel solutions must be stored at approximately 45° F. 7. The appropriate Fluorel L-3203-6 solution is warmed to approximately room temperature and is sprayed using a Brinks Model 7 spray gun having a 36 SD nozzle at an operating pressure of 35 psi. 8. The pigmented Fluorel solution is sprayed slowly, vaporizing the maximum quantity of MEK during spraying. Continue to spray until 5 ± 2 mils coating is obtained on the interior and furniture surfaces. Control panels of the same materials will be sprayed simultaneously to verify the coating thickness. 9. The Fluorel-coated interior and furniture surfaces will be air dried for a minimum of 3 days. No heat, in any manner, is to be applied during this period as it may cause the coating to crack or blister. Time drying started _____ Time drying completed _____ 10. Conduct visual acceptance inspection of coated surfaces for imperfections such as blistering, cracking, checking, et cetera.	

MOBILE QUARANTINE FACILITY FIREPROOFING COATING TOUCHUP PROCEDURES

Introduction

The interior and furniture surface of the MQF have been fireproofed to FAA specification using pigmented Fluorel L-3203-6, 20 percent homogenized solution. On reinstalling the furniture, unintentional scratches or nicks in the MQF fireproof coating will result. These procedures describe how the damaged areas are to be repaired.

Environmental Conditions

The environmental conditions in the area for painting shall be as follows.

Relative humidity	55 ± 20 percent
Air temperature	80° ± 10° F

Surface Preparations and Paint Application

MQF serial no.	Date		Inspection
		1. No surface preparation, such as sanding or roughing, is required or necessary. 2. Dampen a piece of cheesecloth with MEK and feather the edges of the scratch or cut. 3. Allow feathered area to dry for 5 minutes. Time drying started _____ Time drying completed _____	

MQF serial no.	Date		Inspection
		4. The appropriate Fluorel L-3203-6 pigmented solution is mixed using a shaker for a minimum of 5 minutes, warmed to approximately room temperature and is sprayed, blending the repaired area into the surrounding surface. The spray is accomplished by using a Brinks Model 7 spray gun having a 36SD nozzle at an operating pressure of 35 psi. Fluorel solution batch or fabrication number _____ and part number _____ used. NOTE, The appropriate Fluorel L-3203-6 pigmented solution is prepared according to the previous MQF fireproofing procedures. 5. The pigmented Fluorel solution is sprayed slowly, vaporizing the maximum quantity of MEK during spraying. Continue to spray until the repaired area blends into the surface and is no longer visible. 6. The Fluorel-coated interior and furniture repaired surfaces will be air dried for a minimum of 3 days. No heat, in any manner, is to be applied during this period as it may cause the coating to crack or blister. Time drying started _____ Time drying completed _____ 7. Conduct visual acceptance inspection of repaired surfaces for imperfections such as blistering, cracking, checking, et cetera.	

PROCEDURE FOR FLUOREL COATING THE FLOODLIGHT GLARE SHIELD

1. Clean the bronze screen wire per MSC Spec-C-8, Class A.

2. Using 3M number 361 tape, cover the screen wire over an area sufficient to hold the wire in place after cutting.

3. After cutting the screen wire to the required size use a hand roller and roll the tape to remove the trapped air. Apply a strip of the 1 inch number 361 tape around all the edges overlapping one-half inch on each side and roll again to remove air.

4. Care must be taken during steps 2 and 3 above to guard against contaminants from the work area.

5. Bend tape covered screen wire as per drawing requirements.

6. Mix black pigment, (Harshaw Chemical Company meteor black 541-214-37, number 7890) in MEK using a ratio of 115 grams of black pigment to 101 grams of MEK per quart of Fluorel L-3203-6, 20 percent homogenized solution (Raybestos-Manhattan). This final pigment mixture can be escalated by multiplying the above formula by the number of quarts needed to accomplish task. The pigment mixture is added to the Fluorel solution and mixed with the means of a Red Devil paint mixer for 5 minutes. Caution: Do not permit an excessive quantity of MEK to evaporate from the final pigment and Fluorel mixtures prior to application.

7. The black-pigmented Fluorel L-3203-6 solution is sprayed, using a Brinks Model 7 spray gun having a 36 SD nozzle at an operating pressure of 35 psi.

8. The black-pigmented Fluorel L-3203-6 solution is sprayed on the tape slowly, vaporizing the maximum quantity of MEK during spraying as not to allow the MEK to dissolve the tape adhesive, to obtain 6 ± 2 mils coating on each side of the floodlight glare shield.

9. The floodlight glare shield is air dried for a minimum of 12 hours. No heat, in any manner, is to be applied during this period as it may cause the coating to crack or blister.

10. Oven dry the floodlight glare shield for 4 hours at 250° F.

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